Final Report of Sampling and Remediation Efforts on Van Hook Wildlife Management Area Impacted by Lunker Federal #2-33-4H

September 9, 2013

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September 9, 2013

Raymond M. Gorka
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Denver, CO 80202

Re: Final Report on Sampling and Remediation Efforts on Van Hook Wildlife Management Area Impacted by Lunker Federal #2-33-4H

Dear Mr. Gorka:

Lowham Walsh LLC conducted sampling campaigns upon the Van Hook Wildlife Management Area within an area impacted by the well event originating from Lunker Federal #2-33-4H between December 12 and 14, 2012. Formal sampling campaigns were conducted on April 25, April 29, May 6, and June 5, 2013. Additionally, a background water sample was collected on January 13, 2013. Samples of interest were also collected on April 10, and April 11, 2013.

Samples were collected according to standard field protocols. The samples were shipped to ESC Lab Sciences, 12065 Lebanon Road, Mount Juliet, TN. This report details the laboratory results obtained from analyses performed on the collected samples and provides an interpretation of those results. Further, field observations and photographs taken during the field operations are included in the report, as well as interpretation of those observations and photographs.

Also included in this report is a compilation of remediation activities undertaken on the upland areas of the Van Hook Wildlife Management Area. This includes treatment of trees with EcoBiotic® (a microbial consortium capable of consuming crude petroleum) and a prescribed burn.

Should you have any questions, please contact me at 701-595-2725 or by email at ppansegrau@lowhamwalsh.com.

Sincerely,

Paul D Pansegrau

Paul D. Pansegrau, Ph.D.
North Dakota Operations Manager

Attachment

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LIST OF ACRONYMS

% Rec.	Percent recovery
µg/L	Micrograms per liter
µmhos/cm	Micro reciprocal ohms per centimeter
BDL	Below detection limit
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Calc.	Calculated
DRO	Diesel Range Organics
E&P	Exploration and Production
EPA	Environmental Protection Agency
FBIR	Fort Berthold Indian Reservation
GPS	Global Positioning System
GRO	Gasoline Range Organics
HDPE	High Density Polyethylene
Lowham	Lowham Walsh LLC
Lunker	Lunker Federal #2-33-4H
mg/Kg	milligrams per kilogram
mg/L	milligrams per liter
NDDH	North Dakota Department of Health
NDG&F	North Dakota Department of Game and Fish
NTU	Nephelometric Turbidity Units
ORO	Oil range organics
PAH	Polycyclic aromatic hydrocarbons
ppm	parts per million
Prairie	Prairie Disposal Inc.
R360	R360 Environmental Solutions
RCRA	Resource Conservation and Recovery Act
Slawson	Slawson Exploration Company, Incorporated
su	Standard Units for the pH scale
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
Walsh	Walsh Environmental Scientists and Engineers, LLC
WMA	Van Hook Wildlife Management Area

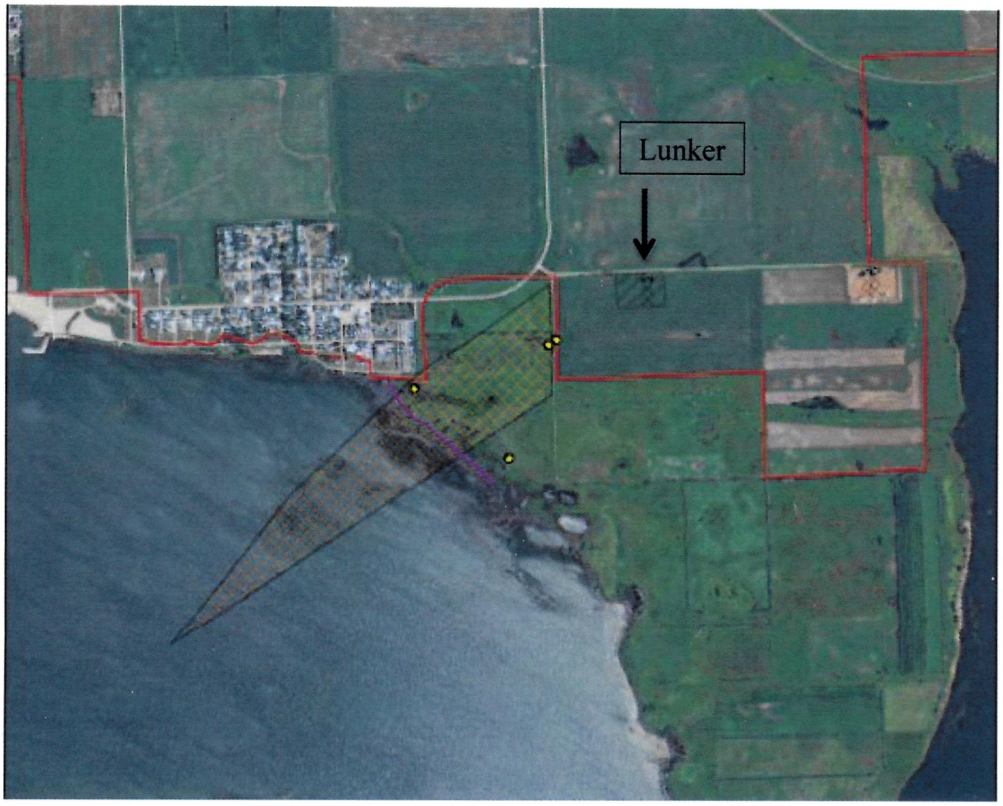
Final Report of Sampling and Remediation Efforts on Van Hook Wildlife Management Area Impacted by Lunker Federal #2-33-4H

1 INTRODUCTION

On December 12, 2012, loss of well control was experienced on Lunker Federal #2-33-4H (Lunker). Well control was regained on December 14, 2012. Lunker is owned and operated by Slawson Exploration Company, Incorporated (Slawson). Lunker is located within the boundaries of Fort Berthold Indian Reservation (FBIR), on Section 33, Township 152W, Range 91N. It should be recognized that the impacted area includes land and water adjacent to Lake Sakakawea, an impoundment of water created by damming the Missouri River between the towns of Pick City, and Riverdale, ND.

Impacts to neighboring land were controlled by prevailing wind direction, and limited to the first area immediately north of Lunker, and the second area to the southwest of Lunker. This is depicted in Figure 1.

Figure 1. Areas impacted by Lunker Federal #2-33-4H.



Highlighted features in Figure 1 include:

1. A red line depicting the Garrison Project (USACE) boundary
2. A black line enclosing a yellow cross hatch pattern depicting the main impact zone
3. Yellow dots depicting installed short-section hay filter strips
4. A purple line depicting an installed long-section hay filter strip with sorbent boom strips installed in major drainage pathways

Impacts to the area immediately north of the Lunker pad were addressed via scooping and hauling of impacted snow and soil as described in a report entitled "*Progress on Cleanup of Lunker Federal #2-33-4H*", issued February 6, 2013 by Lowham Walsh to Slawson.

Impacts to the area southwest of the Lunker pad are split between two tracts: 1.) Privately held farmland neighboring the pad, and 2.) Land held by U.S. Army Corps of Engineers (USACE), but managed by North Dakota Department of Fish and Game (NDG&F), identified as the Van Hook Wildlife Management Area (WMA). The second tract, with impacted area, is shown in Figure 1 with the impacted area highlighted with yellow, crossed lines. Cleanup of the first tract is described in the previously cited report.

This report describes sampling campaigns, deciduous and coniferous tree spraying, and a prescribed burn that were performed on the second tract of land. The tree spraying zones and the prescribed burn zones are shown in Figures 2 and 3.

Figure 2. Impacted Tree Zones in Upland Habitat.

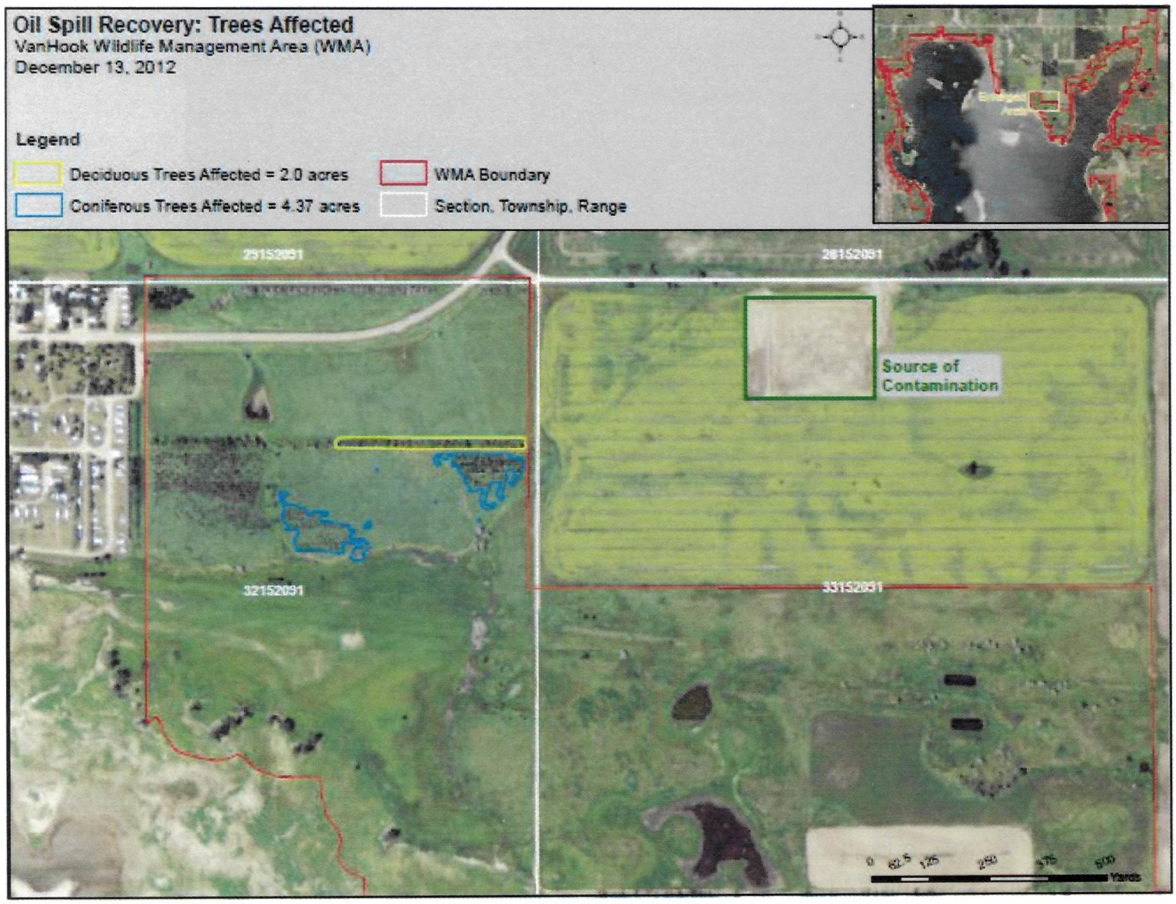
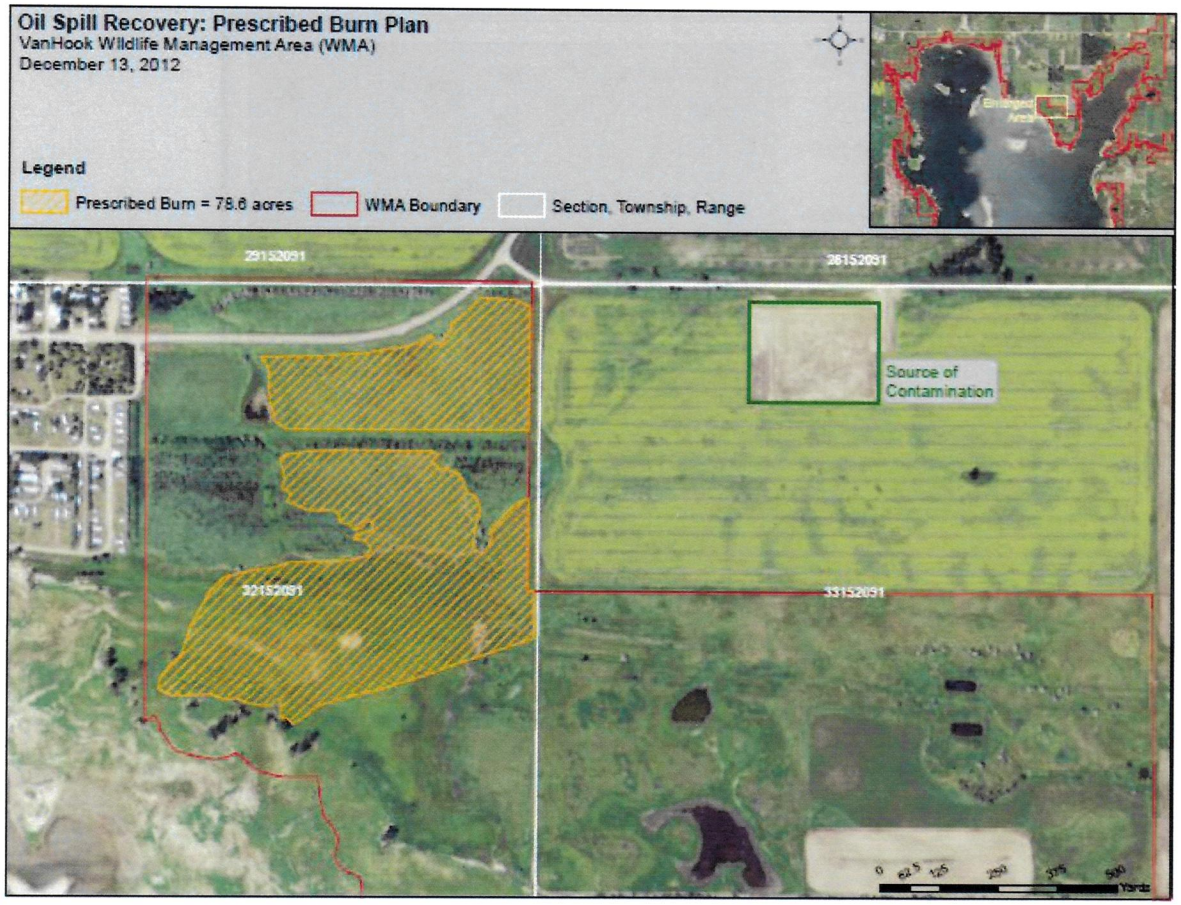


Figure 3. Prescribed Burn Zones in Upland Habitat.

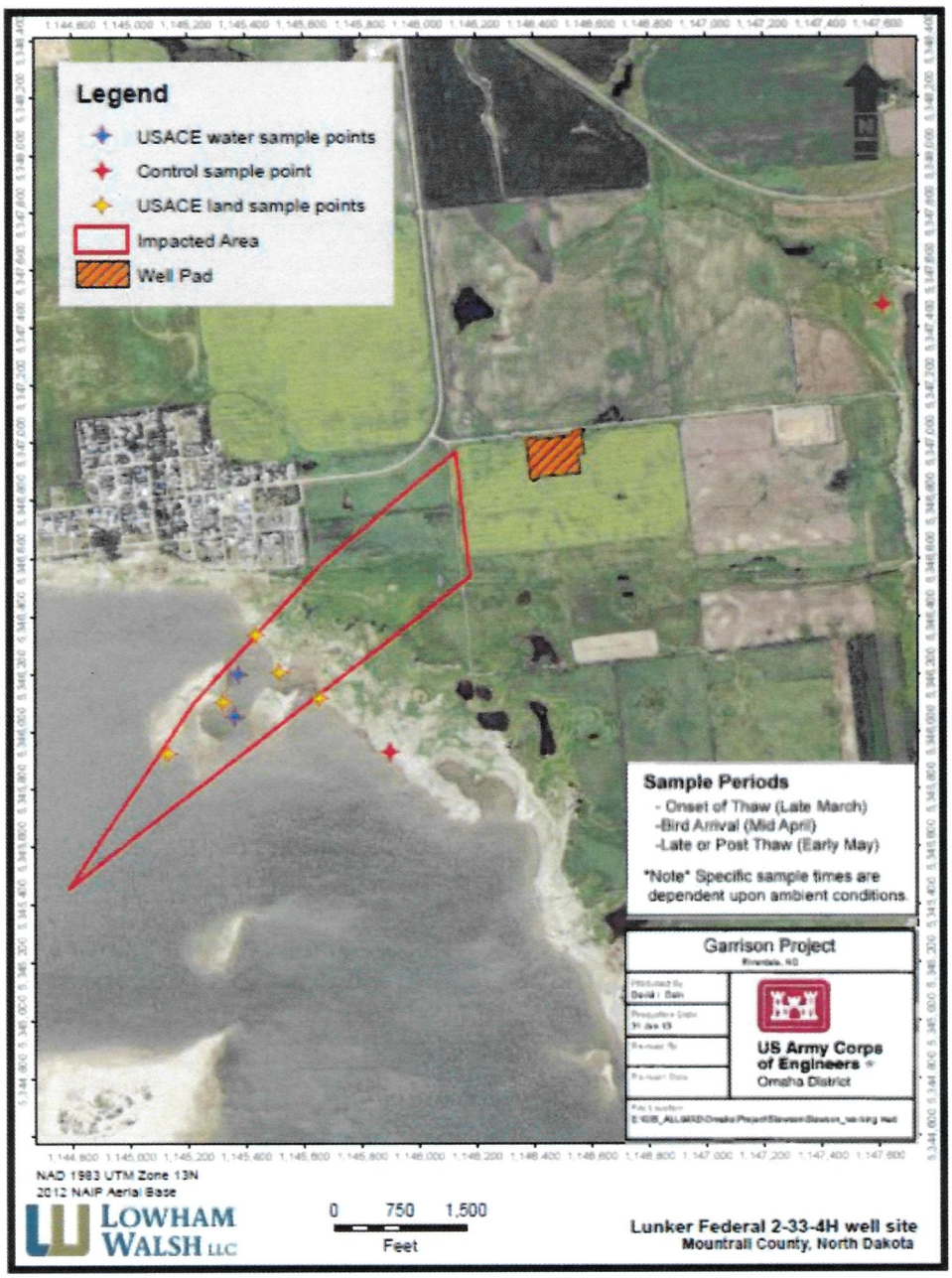


The sampling locations, as agreed to in the final version of a report entitled *"Revised Sampling Plan for Lunker Federal #2-33-4H"*, issued April 5, 2013 by Lowham Walsh, are shown in Figure 4. Sampling coordinates corresponding to the location depicted in Figure 4, along with sample location identification names are presented in Table 1.

Table 1. Sample Location Identifications and Original Coordinates.

Location Identification	Latitude (decimal-degrees)	Longitude (decimal-degrees)
1 Control (SE)	47.939620	-102.347904
2 Control (NE)	47.951675	-102.322901
3 USACE LAND	47.941779	-102.355284
4 USACE LAND	47.940339	-102.358098
5 USACE LAND	47.943733	-102.353455
6 USACE LAND	47.942517	-102.352588
7 USACE LAND	47.941527	-102.350872
8 USACE WATER	47.941276	-102.354864
9 USACE WATER	47.942586	-102.354472

Figure 4. Figure of Impacted Wildlife Management Area and Sample Locations.



It should be noted that the impacted zone is identified as critical habitat for the Piping Plover, a threatened species, by U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service.

2 SAMPLING OBJECTIVES

Sampling of the impacted zone categorized as critical habitat for the Piping Plover was conducted to determine if residual chemicals from the well event remained in the area, and if the concentrations of these chemicals were at a level that would warrant further studies, such as a screening risk assessment to Piping Plover and a macro invertebrate sampling program. The typical breeding habitat of a Piping Plover includes beaches or sand flats that are devoid of vegetation.

3 SAMPLING LOCATIONS

With these criteria in mind, sample points which were near the critical habitat were identified by USACE as preferred sampling locations. These locations were three points along the shoreline; one on the northwest edge of the impact zone, one in the center of the zone, and one on the southeast edge of the impact zone. Two other sample points were identified through the main track of the impact plume, leading toward the main body of Lake Sakakawea. The final two sample locations were background sample points, one to the southeast of the impact zone, along the shore line; and a second background sample point to the northeast of the impact zone. Sampling locations are shown on Photographs 1 through 9 in Appendix B.

During the first sampling campaign, it was determined that the identified sample points depicted in Figure 4, and identified in Table 1, were presently located in upland habitat, not in Plover habitat. This was due to the aerial image used for selection of sample locations being slightly out of date and not truly representative of current conditions. Based upon field conditions, sample locations were moved during the first campaign toward the lake shore, and into barren beach terrain, which is more representative of Plover habitat. During the second campaign, sample locations USACE 3 and USACE 5 were moved inward, more to the center of the impact zone. Table 2 lists the sampling locations across all three sampling campaigns.

In general, sample locations were varied somewhat over the 3 separate campaigns. For the first campaign, 5 USACE LAND, 6 USACE LAND, and 7 USACE LAND were moved to the southwest in order to sample outside upland (brushy) habitat, and more into Plover (barren beach) habitat. Also during the first campaign, extensive winter ice was prevalent on the water sample locations (8 and 9 USACE WATER). These locations were changed for the first campaign in order to gain access to liquid water. For the second campaign, sample locations for 5 and 6 USACE LAND were moved about 30 feet toward the supposed centerline of the impact zone. This was done as the results of the first campaign had shown no hydrocarbon in either of the two samples. Finally, for the third campaign, sample points identified as 5, 6, and 7 USACE LAND were moved further toward the southwest as vegetation had grown over the locations previously utilized, and it was still desired to sample barren beach habitat that was representative of Piping Plover habitat.

Table 2. Sampling Locations.

Location ID	Campaign	Latitude	Longitude
Control 1 (SE)	Original	47.93962	-102.34790
	April 29, 2013	47.93948	-102.34813
	May 6, 2013	47.93954	-102.34816
	June 5, 2013	47.93949	-102.34848
Control 2 (NE)	Original	47.95168	-102.32290
	April 25, 2013	47.95171	-102.32173
	May 6, 2013	47.95175	-102.32173
	June 5, 2013	47.95174	-102.32173
3 USACE LAND	Original	47.94178	-102.35528
	April 25, 2013	47.94179	-102.35530
	May 6, 2013	47.94174	-102.35518
	June 5, 2013	47.94154	-102.35550
4 USACE LAND	Original	47.94034	-102.35810
	April 25, 2013	47.94034	-102.35811
	May 6, 2013	47.94032	-102.35811
	June 5, 2013	47.94044	-102.35817
5 USACE LAND	Original	47.94373	-102.35346
	April 25, 2013	47.94374	-102.35352
	May 6, 2013	47.94257	-102.35285
	June 5, 2013	47.94311	-102.35333
6 USACE LAND	Original	47.94252	-102.35259
	April 25, 2013	47.94256	-102.35277
	May 6, 2013	47.94254	-102.35283
	June 5, 2013	47.94235	-102.35291
7 USACE LAND	Original	47.94153	-102.35087
	April 25, 2013	47.94138	-102.35102
	May 6, 2013	47.94141	-102.35104
	June 5, 2013	47.94178	-102.35155
8 USACE WATER	Original	47.94128	-102.35486
	April 25, 2013	47.94251	-102.35476
	May 6, 2013	47.94139	-102.35506
	June 5, 2013	47.94254	-102.35481
9 USACE WATER	Original	47.94259	-102.35447
	April 25, 2013	47.94138	-102.35504
	May 6, 2013	47.94288	-102.35407
	June 5, 2013	47.94293	-102.35420

4 CHEMICALS OF CONCERN AND INTEREST

A meeting was held on January 17, 2013 at North Dakota Game & Fish offices in Riverdale, ND. One topic discussed at this meeting was the proposed sampling campaign, and chemical concentrations to be determined by laboratory analysis. Two types of samples were identified as being required, soil samples and water samples. Based upon recommendations provided by Kris Roberts of the North Dakota Department of Health (NDDH), and Jessica Johnson of U.S. Fish and Wildlife Service (USFWS) the following parameters for soil and water samples were compiled:

Sample parameters for the soil samples:

- Diesel Range Organics (DRO) and Oil Range Organics (ORO) via modified Method 8015 (C_{40} maximum)
- Gasoline Range Organics (GRO) via Method 8015
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) via Method 8015
- Specific Conductance by Method 9050A
- SAR via Method 9056
- pH via Method 9045C
- Total metals by Method 3050 and either Method 6010 or Method 7421 for aluminum, antimony, arsenic, barium, boron, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, zinc
- Bromide
- Sulfates
- Polycyclic aromatic hydrocarbons (PAH) by Method 8270.
- Chloride

Sample parameters for the water samples:

- DRO and ORO via Method 8015 (C_{40} maximum)
- GRO via Method 8015
- North Dakota Department of Health Group 7 total metals by Method 3050 and either Method 6010 or Method 7421 for aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, thallium, and zinc
- North Dakota Department of Health Group 30 for ammonia, Kjeldahl nitrogen (TKN), nitrate-nitrite, phosphorus (total), and total nitrogen
- North Dakota Department of Health Group 187 (less analytes from Groups 7 and 30) for alkalinity (total), bicarbonate, calcium, carbonate, chloride, dissolved solids (calculated), fluoride, hardness, hydroxide, magnesium, pH, potassium, silica, sodium, specific conductance, sulfate (percent), and turbidity
- Bromide
- BTEX via Method 8015

- PAH by Method 8270-SIM

It should be noted that DRO determination is an extended range method, and will include Oil Range Organics (ORO). The lab reports may list ORO components as a separate line item. Additionally, the first round of water samples was analyzed for heavy metals according to Method 6010, as listed above. In the second and third campaigns, the water samples were analyzed by Method 6020. In general, Method 6020 (Inductively Couple Plasma – Mass Spectrum) is a more sensitive method, with detection limits lower by a factor of about 1000 than Method 6010 (Inductively Coupled Plasma – Atomic Emission). This change was made as a matter of convenience for the laboratory service provider at no increased cost to Slawson, and increased analytical fidelity for the project. Sample reports note this change.

5 MONITORING AND REMEDIATION ACTIVITIES

Four major activities are encompassed in this area:

- Monitoring conditions in the impacted zone, especially during the Spring thaw and runoff season.
- Treatment of impacted trees with EcoBiotic®.
- Execution of a prescribed burn of upland grasses.
- Collection of a control water sample and collection of runoff water samples.

Remediation activities which occurred on private lands adjacent to the WMA have been previously described (*Progress on Cleanup of Lunker Federal #2-33-4H*, February 14, 2013, Lowham Walsh, LLC), and are not described in this report.

5.1 MONITORING ACTIVITIES

The majority of western North Dakota experienced a late arrival of spring in 2013. This included the Lunker Federal #2-33-4H site. Additionally, a late-winter blizzard impacted the region on April 14, 2013. The net effect was that the impacted zone experienced two spring thaws and associated snow melt/runoff events. Examples of the snow cover and runoff are shown in Photographs 10 through 13 in Appendix B.

The majority of the first runoff event occurred prior to April 4, 2013. Both USACE and Lowham Walsh personnel were monitoring the event on April 4th. On the basis of observations recorded on April 4th, a joint walk of the impacted WMA was held on April 12th. Attendees were Paul Pansegrau (Lowham Walsh), David Peters (Lowham Walsh), William Harlon, (USACE), Kent Luttschwager, and others (NDG&F). Observations from all monitoring events are recorded in *Lunker Federal #2-33-4H Weekly Inspection Reports* dated April 5, 2013, April 16, 2013, and April 22, 2013 (Lowham Walsh, LLC). Additionally, William Harlon (USACE) issued a report dated April 4, 2013.

A summary of the total impacts is described in the Conclusions section of this report.

5.2 ECOBIOTIC APPLICATIONS

It was determined that an application of Ecobiotic® to both deciduous and coniferous trees would minimize any potential negative impacts to the trees resulting from exposure to drift from the Lunker Federal well event. The stands of trees are shown in Photographs 14 through 16 in Appendix B.

An application of Ecobiotic® was performed to the coniferous trees on January 9th. A second application of Ecobiotic® was performed on May 20th, which included both deciduous and coniferous trees. Both applications were performed by Enviro Shield Products, Incorporated of Williston, North Dakota.

5.3 PRESCRIBED BURN

Due to an unusual spring weather season, which included the blizzard previously described, and a subsequent three-week rainy spell, the prescribed burn was delayed until a short window of opportunity on June 10th. Badger Creek Wildfire of Poplar, Montana performed the burn, which included extensive planning and preparative work. The prescribed burn is shown in Photographs 17 through 19 in Appendix B.

According to the initial plan, the hay filters that were in place were to be completely consumed by the prescribed burn. Due to the exceedingly wet weather cycle prior to June 10th, the hay filters were too wet to be completely consumed by fire. The unburned portions of the hay filters were removed with equipment and labor beginning on July 12, 2013, and completed on September 4, 2013.

5.4 COLLECTION OF A CONTROL WATER SAMPLE

A control water sample was collected through the ice of the isolated pond on January 13, 2013. The sample was submitted for analysis

5.5 COLLECTION OF RUNOFF WATER AND SOIL SAMPLES

A runoff water sample was collected on April 10, 2013. The runoff water sample was collected at the shoreline, as the water departed the upland habitat area prior to entering the isolated pond.

A soil sample was collected on April 11, 2013. The site was along the west shoreline of the isolated pond where some discolored snow had been observed and removed.

Results for both the water and soil sample are reported in Section 7, Laboratory Results.

6 SAMPLING CAMPAIGNS

Sampling times were to be: 1.) onset of spring thaw (late March), 2.) Piping plover arrival (mid-April), and 3.) late- or post-thaw (early May). In actuality, sampling was conducted on April 25, April 29, May 6, and June 5, 2013. This was due to late arrival of spring, and a late-season winter blizzard (April 14, 2013). This led to two spring thaws, one pre-Blizzard thaw and runoff

event occurring about April 10, 2013, and a post-blizzard and runoff event occurring after April 15, 2013.

The first sampling campaign was conducted on April 25, 2013 (with a follow up of a single sample occurring on April 29, 2013). The second sampling campaign was conducted on May 6, 2013 and the third campaign was conducted on June 5, 2013.

Due to the potential presence of Piping Plover, and potential eggs on the ground, USACE provided escort services by highly-qualified biologists in order to avoid any "take" of Plover during the sampling campaign. Assigned biologists and escorts are listed in Table 3.

Table 3. USACE Biologists and Escorts.

Date	Personnel Names
April 25, 2013	Michael Morris
April 29, 2013	Michael Morris
May 6, 2013	Swade Hammond and Craig Hultberg
June 5, 2013	Michael Morris

6.1 SAMPLING CONDITIONS

Weather conditions were largely favorable on all dates. Conditions are listed in Table 4.

Table 4. Local Weather Conditions during Sampling.

Date	Conditions
April 25, 2013	40°F, 5 mph winds, mostly sunny skies. Ice covered bodies of water.
April 29, 2013	50°F, 5 mph winds, mostly cloudy skies. Ice covered bodies of water.
May 6, 2013	50°F, 10-15 mph winds, clear skies. Ponds and lakes were open.
June 5, 2013	55°F, 15 mph winds, partly cloudy and clearing. Vegetation was green.

Weather conditions did not impede sampling efforts on any day.

6.2 SAMPLING METHODS

For the first two sampling campaigns a Trimble® device, pre-loaded with Sample Location ID and coordinates was utilized for navigation. Unfortunately, the Trimble® was unable to simultaneously display the map layer and the navigation layer. Consequently, the exact locations relative to the impact area boundary, as shown in Figure 1, was not known. For the third sampling campaign, a Bad Elf GPS Pro was utilized in conjunction with an iPhone for navigation and recording sample locations. The GPS Pro and the iPhone communicated with one another via a Bluetooth connection. The iPhone utilized the GPS Kit app by Garafa, LLC.

Once navigation to a sample soil site had been achieved, a spot for collection of a sample was agreed to in conjunction with USACE personnel. The GPS coordinates and location identity were logged and a sample ID assigned. The sample collection time was also logged. Soil from the agreed-to spot was scraped into a pile, scraping no more than 1 inch below original soil surface. The scraping action was performed within a roughly circular area working toward the

center. The pile generated was mixed thoroughly and then packed into four separate jars specific to the analytical suite of analyses to be performed.

Navigation to water sample collection sites was slightly different. The coordinates recorded were most often approximately 30 feet from the actual sample location. This was due to a need to wade to a location where the sample could be collected without simultaneous collection of silt from the bottom of the body of water. The sample was provided a sample identity and the time was logged. Samples were collected into appropriate containers and preserved as appropriate. The samples were labeled and placed into a cooler on ice. A total of eight separate containers constituting one sample were collected at each site specific for analytical purposes.

It was the duty of the USACE representative to identify an appropriate duplicate soil sample. The duplicate sample was logged accurately in the field notebook, but a false time of collection was recorded on the sample label so the laboratory could not readily identify any sample as a duplicate.

7 LABORATORY RESULTS

In the following tables, values for hydrocarbons above detection limits are highlighted in green.

7.1 BACKGROUND WATER SAMPLE RESULTS

A background water sample was collected from the isolated body of water on the Van Hook WMA on January 23, 2013. It should be noted that this sample was collected prior to a complete decision on the analytical parameters to be determined for water samples collected from the impact zone. Sample parameters that were analyzed for were based upon recommendations from NDDH. Parameters that were requested from the sample were NDDH Group 7, 30, and 187, plus bromide. The results are shown in Table 5.

Collection of the sample involved cleaning an area of ice on the body of water, in order to prevent potential surface contamination from entering the water, then chopping a hole in the ice large enough to allow collection of a sample. The sample point was near the shoreline, as region temperatures had not been very cold long enough to allow a thick ice to develop on the surface of the water.

Table 5. Background Water Sample Results

Lab Sample ID			L616859-01
Client Sample ID			BASELINE
Collection Date			1/23/2013
Method	**Parameter**	**Units**	**Value**
9056	Bromide	mg/l	<1.0
9056	Chloride	mg/l	49
9056	Fluoride	mg/l	1
9056	Sulfate	mg/l	910
2320 B-2011	Alkalinity	mg/l	890

Lab Sample ID			L616859-01
Client Sample ID			BASELINE
Collection Date			1/23/2013
Method	**Parameter**	**Units**	**Value**
2320 B-2011	Alkalinity, Bicarbonate	mg/l	890
2320 B-2011	Alkalinity, Carbonate	mg/l	<200
2320 B-2011	Alkalinity, Hydroxide	mg/l	<200
130.1	Hardness, Total (mg/L as CaCO3)	mg/l	1500
Calc.	Total Nitrogen	mg/l	7.2
350.1	Ammonia Nitrogen	mg/l	0.28
9040C	pH	su	7.9
353.2	Nitrate-Nitrite	mg/l	<0.10
365.4	Phosphorus, Total	mg/l	1.4
9050A	Specific Conductance	µmhos/cm	2900
351.2	Kjeldahl Nitrogen, TKN	mg/l	7.2
2130 B-2011	Turbidity	NTU	710
2540 C-2011	Dissolved Solids	mg/l	2200
6020	Antimony	mg/l	<0.0010
6020	Arsenic	mg/l	0.012
6020	Beryllium	mg/l	<0.0010
6020	Cadmium	mg/l	0.00067
6020	Chromium	mg/l	0.0094
6020	Copper	mg/l	0.023
6020	Lead	mg/l	0.0098
6020	Nickel	mg/l	0.037
6020	Selenium	mg/l	0.0039
6020	Silver	mg/l	<0.0010
6020	Thallium	mg/l	<0.0010
6020	Zinc	mg/l	0.057
6010B	Aluminum	mg/l	11
6010B	Barium	mg/l	0.45
6010B	Boron	mg/l	0.42
6010B	Calcium	mg/l	350
6010B	Iron	mg/l	23
6010B	Magnesium	mg/l	160
6010B	Manganese	mg/l	1.6
6010B	Potassium	mg/l	20
6010B	Silicon	mg/l	22
6010B	Sodium	mg/l	310
Calc.	Silica	mg/l	47
8021B	Benzene	mg/l	<0.00050

Lab Sample ID			L616859-01
Client Sample ID			BASELINE
Collection Date			1/23/2013
Method	**Parameter**	**Units**	**Value**
8021B	Toluene	mg/l	<0.0050
8021B	Ethylbenzene	mg/l	<0.00050
8021B	Total Xylene	mg/l	<0.0015
8021B	α,α,α-Trifluorotoluene(PID)	% Rec.	110

7.2 RUNOFF WATER SAMPLE

A runoff water sample was collected on April 10, 2013. The sample location was below all hay filters and sorbent booms, near the shoreline of the isolated pond, somewhat down-gradient of sample location 6 USACE LAND. The intent was to determine if petroleum-based hydrocarbons were entering the waters of Lake Sakakawea via the natural drainage of the impact zone. Results are presented in Table 6.

Table 6. Runoff Water Sample.

Lab Sample ID			L630115-01
Client Sample ID			WS-41013-1
Collection Date			4/10/2013
Method	**Parameter**	**Units**	**Value**
9056	Bromide	mg/l	<1.0
9056	Chloride	mg/l	3.6
9056	Fluoride	mg/l	0.12
9056	Sulfate	mg/l	220
2320 B-2011	Alkalinity	mg/l	99
2320 B-2011	Alkalinity, Bicarbonate	mg/l	99
2320 B-2011	Alkalinity, Carbonate	mg/l	<20
2320 B-2011	Alkalinity, Hydroxide	mg/l	<20
130.1	Hardness, Total (mg/L as CaCO3)	mg/l	280
Calc.	Total Nitrogen	mg/l	4.9
350.1	Ammonia Nitrogen	mg/l	0.99
9040C	pH	su	7.6
353.2	Nitrate-Nitrite	mg/l	1.1
365.4	Phosphorus, Total	mg/l	0.26
9050A	Specific Conductance	µmhos/cm	630
351.2	Kjeldahl Nitrogen, TKN	mg/l	3.8
2130 B-2011	Turbidity	NTU	32
2540 C-2011	Dissolved Solids	mg/l	480
6020	Antimony	mg/l	<0.0010
6020	Arsenic	mg/l	0.0027
6020	Beryllium	mg/l	<0.0010

Lab Sample ID			L630115-01
Client Sample ID			WS-41013-1
Collection Date			4/10/2013
Method	**Parameter**	**Units**	**Value**
6020	Cadmium	mg/l	<0.00050
6020	Chromium	mg/l	<0.0020
6020	Copper	mg/l	0.0043
6020	Lead	mg/l	<0.0010
6020	Nickel	mg/l	0.0077
6020	Selenium	mg/l	0.0014
6020	Silver	mg/l	<0.0010
6020	Thallium	mg/l	<0.0010
6020	Zinc	mg/l	<0.010
6010B	Aluminum	mg/l	0.11
6010B	Barium	mg/l	0.063
6010B	Boron	mg/l	<0.20
6010B	Calcium	mg/l	80
6010B	Iron	mg/l	0.22
6010B	Magnesium	mg/l	21
6010B	Manganese	mg/l	0.027
6010B	Potassium	mg/l	24
6010B	Silicon	mg/l	5
6010B	Sodium	mg/l	16
Calc.	Silica	mg/l	11
8015D/GRO	TPH (GC/FID) Low Fraction	mg/l	<0.10
8015D/GRO	α,α,α-Trifluorotoluene(FID)	% Rec.	95
8260B	Benzene	mg/l	<0.0010
8260B	Toluene	mg/l	<0.0050
8260B	Ethylbenzene	mg/l	<0.0010
8260B	Total Xylenes	mg/l	<0.0030
8260B	Toluene-d8	% Rec.	96
8260B	Dibromofluoromethane	% Rec.	93
8260B	α,α,α-Trifluorotoluene	% Rec.	97
8260B	4-Bromofluorobenzene	% Rec.	92
8015	C10-C28 Diesel Range	mg/l	<0.10
8015	C28-C40 Oil Range	mg/l	<0.10
8015	o-Terphenyl	% Rec.	86
8270C-SIM	Anthracene	mg/l	<0.000050
8270C-SIM	Acenaphthene	mg/l	<0.000050
8270C-SIM	Acenaphthylene	mg/l	<0.000050
8270C-SIM	Benzo(a)anthracene	mg/l	<0.000050

Lab Sample ID			L630115-01
Client Sample ID			WS-41013-1
Collection Date			4/10/2013
Method	**Parameter**	**Units**	**Value**
8270C-SIM	Benzo(a)pyrene	mg/l	<0.000050
8270C-SIM	Benzo(b)fluoranthene	mg/l	<0.000050
8270C-SIM	Benzo(g,h,i)perylene	mg/l	<0.000050
8270C-SIM	Benzo(k)fluoranthene	mg/l	<0.000050
8270C-SIM	Chrysene	mg/l	<0.000050
8270C-SIM	Dibenz(a,h)anthracene	mg/l	<0.000050
8270C-SIM	Fluoranthene	mg/l	<0.000050
8270C-SIM	Fluorene	mg/l	<0.000050
8270C-SIM	Indeno(1,2,3-cd)pyrene	mg/l	<0.000050
8270C-SIM	Naphthalene	mg/l	<0.00025
8270C-SIM	Phenanthrene	mg/l	<0.000050
8270C-SIM	Pyrene	mg/l	<0.000050
8270C-SIM	1-Methylnaphthalene	mg/l	<0.00025
8270C-SIM	2-Methylnaphthalene	mg/l	<0.00025
8270C-SIM	2-Chloronaphthalene	mg/l	<0.00025
8270C-SIM	Nitrobenzene-d5	% Rec.	139
8270C-SIM	2-Fluorobiphenyl	% Rec.	117
8270C-SIM	p-Terphenyl-d14	% Rec.	117

7.3 SOIL SAMPLE FROM DISCOLORED SNOW RESULTS

A soil sample was collected from immediately downslope of a pile of discolored snow that was observed during the first thaw/runoff event. The location of the discolored snow was on the west bank of the isolated pond, near sample location 8 USACE WATER. The discolored snow was removed and appropriately disposed. The collection date was April 11, 2013.

Table 7. Results from Soil Downslope of Discolored Snow.

Lab Sample ID			L630410-01
Client Sample ID			SS-41113-1
Collection Date			4/11/2013
Method	**Parameter**	**Units**	**Value**
9056	Bromide	mg/kg	<10
9056	Sulfate	mg/kg	520
9045D	pH	su	7.6
Calc.	Sodium Adsorption Ratio		0.79
9050AMod	Specific Conductance	µmhos/cm	880
6010B	Aluminum	mg/kg	4600

Lab Sample ID			L630410-01
Client Sample ID			SS-41113-1
Collection Date			4/11/2013
Method	**Parameter**	**Units**	**Value**
6010B	Antimony	mg/kg	<1.0
6010B	Arsenic	mg/kg	5.8
6010B	Barium	mg/kg	39
6010B	Beryllium	mg/kg	0.22
6010B	Boron	mg/kg	<10
6010B	Cadmium	mg/kg	<0.25
6010B	Chromium	mg/kg	3.5
6010B	Copper	mg/kg	6
6010B	Lead	mg/kg	3.6
6010B	Nickel	mg/kg	8.2
6010B	Selenium	mg/kg	1.3
6010B	Silver	mg/kg	<0.50
6010B	Thallium	mg/kg	<1.0
6010B	Zinc	mg/kg	20
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	0.64
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	99
8260B	Benzene	mg/kg	<0.0050
8260B	Toluene	mg/kg	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050
8260B	Total Xylenes	mg/kg	<0.015
8260B	Toluene-d8	% Rec.	100
8260B	Dibromofluoromethane	% Rec.	99
8260B	α,α,α-Trifluorotoluene	% Rec.	100
8260B	4-Bromofluorobenzene	% Rec.	93
8015	C10-C28 Diesel Range	mg/kg	<4.0
8015	C28-C40 Oil Range	mg/kg	<4.0
8015	o-Terphenyl	% Rec.	73.3
8270C-SIM	Anthracene	mg/kg	<0.0060
8270C-SIM	Acenaphthene	mg/kg	<0.0060
8270C-SIM	Acenaphthylene	mg/kg	<0.0060
8270C-SIM	Benzo(a)anthracene	mg/kg	<0.0060
8270C-SIM	Benzo(a)pyrene	mg/kg	<0.0060
8270C-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060
8270C-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060
8270C-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060
8270C-SIM	Chrysene	mg/kg	<0.0060
8270C-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060

Lab Sample ID			L630410-01
Client Sample ID			SS-41113-1
Collection Date			4/11/2013
Method	**Parameter**	**Units**	**Value**
8270C-SIM	Fluoranthene	mg/kg	<0.0060
8270C-SIM	Fluorene	mg/kg	<0.0060
8270C-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060
8270C-SIM	Naphthalene	mg/kg	<0.020
8270C-SIM	Phenanthrene	mg/kg	<0.0060
8270C-SIM	Pyrene	mg/kg	<0.0060
8270C-SIM	1-Methylnaphthalene	mg/kg	<0.020
8270C-SIM	2-Methylnaphthalene	mg/kg	<0.020
8270C-SIM	2-Chloronaphthalene	mg/kg	<0.020
8270C-SIM	Nitrobenzene-d5	% Rec.	115
8270C-SIM	2-Fluorobiphenyl	% Rec.	79.2
8270C-SIM	p-Terphenyl-d14	% Rec.	61.9

7.4 SOIL SAMPLE ANALYTICAL RESULTS

A summary of the soil analytical data collected from sampling points 3 USACE, 4 USACE, 5 USACE, 6 USACE, 7 USACE, 1 Control SE, and 2 Control NE are provided in Tables 8 through 14, respectively. The tables provide data for the April 25, April 29, May 6, and June 5, 2013 sampling events.

Table 8. 3 USACE LAND Results.

Lab Sample ID			L632922-01	L634434-02	L639891-02
Client Sample ID			SS01-042513	SS02-050613	SS02-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
9056	Bromide	mg/kg	<10	<10	<10
9056	Chloride	mg/kg	67	88	62
9056	Sulfate	mg/kg	<50	550	<50
9045D	pH	su	8.3	7.8	8.4
Calc.	Sodium Adsorption Ratio		0.34	2.6	2.5
9050AMod	Specific Conductance	µmhos/cm	230	1000	230
6010B	Aluminum	mg/kg	1400	9800	13000
6010B	Antimony	mg/kg	<1.0	<1.0	<1.0
6010B	Arsenic	mg/kg	3.2	2.5	8.6
6010B	Barium	mg/kg	27	98	140
6010B	Beryllium	mg/kg	0.24	0.35	0.27
6010B	Boron	mg/kg	<10	<10	17
6010B	Cadmium	mg/kg	<0.25	<0.25	<0.25
6010B	Chromium	mg/kg	3.1	15	23
6010B	Copper	mg/kg	2.8	7.9	20
6010B	Lead	mg/kg	2.6	5.8	8
6010B	Nickel	mg/kg	6.4	12	23
6010B	Selenium	mg/kg	1.2	<1.0	4.4
6010B	Silver	mg/kg	<0.50	<0.50	<0.50
6010B	Thallium	mg/kg	1.2	<1.0	1.1

Lab Sample ID			L632922-01	L634434-02	L639891-02
Client Sample ID			SS01-042513	SS02-050613	SS02-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
6010B	Zinc	mg/kg	13	35	63
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	<0.50	<0.50	<0.50
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	98	94.4	99.1
8260B	Benzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Toluene	mg/kg	<0.025	<0.025	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Total Xylenes	mg/kg	<0.015	<0.015	<0.015
8260B	Toluene-d8	% Rec.	100	99.5	99.5
8260B	Dibromofluoromethane	% Rec.	101	105	105
8260B	α,α,α-Trifluorotoluene	% Rec.	98.8	95.1	103
8260B	4-Bromofluorobenzene	% Rec.	104	94	97
8015	C_{10}-C_{28} Diesel Range	mg/kg	8.1	<4.0	<4.0
8015	C_{28}-C_{40} Oil Range	mg/kg	9.7	<4.0	<4.0
8015	o-Terphenyl	% Rec.	72.9	38.3	73.1
8270D-SIM	Anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Chrysene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluorene	mg/kg	<0.0060	<0.0060	<0.0060

Lab Sample ID			L632922-01	L634434-02	L639891-02
Client Sample ID			SS01-042513	SS02-050613	SS02-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8270D-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Naphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Phenanthrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	1-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Chloronaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Nitrobenzene-d_5	% Rec.	71.8	77	85.4
8270D-SIM	2-Fluorobiphenyl	% Rec.	79.8	81.8	77.9
8270D-SIM	p-Terphenyl-d_{14}	% Rec.	89.9	114	71.5

Table 9. 4 USACE LAND Results.

Lab Sample ID			L632922-04	L634434-01	L639891-01
Client Sample ID			SS04-042513	SS01-050613	SS01-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
9056	Bromide	mg/kg	<10	<10	<10
9056	Chloride	mg/kg	130	64	57
9056	Sulfate	mg/kg	<50	<50	<50
9045D	pH	su	8.7	8.4	8.2
Calc.	Sodium Adsorption Ratio		1.1	1.1	0.7
9050AMod	Specific Conductance	µmhos/cm	110	170	180
6010B	Aluminum	mg/kg	1100	4100	7300
6010B	Antimony	mg/kg	<2.0	<1.0	<1.0

Lab Sample ID			L632922-04	L634434-01	L639891-01
Client Sample ID			SS04-042513	SS01-050613	SS01-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
6010B	Arsenic	mg/kg	2.3	4.2	4.9
6010B	Barium	mg/kg	30	43	93
6010B	Beryllium	mg/kg	0.15	0.16	0.10
6010B	Boron	mg/kg	<10	<10	<10
6010B	Cadmium	mg/kg	<0.25	<0.25	<0.25
6010B	Chromium	mg/kg	2.7	8.7	13
6010B	Copper	mg/kg	2.9	4.0	7.7
6010B	Lead	mg/kg	2.7	2.8	3.4
6010B	Nickel	mg/kg	5.8	8.2	13
6010B	Selenium	mg/kg	<1.0	<1.0	<1.0
6010B	Silver	mg/kg	<0.50	<0.50	<0.50
6010B	Thallium	mg/kg	<2.0	<1.0	<1.0
6010B	Zinc	mg/kg	11	18	29
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	<0.50	<0.50	<0.50
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	95.2	94.9	102
8260B	Benzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Toluene	mg/kg	<0.025	<0.025	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Total Xylenes	mg/kg	<0.015	<0.015	<0.015
8260B	Toluene-d_8	% Rec.	101	99.4	99.6
8260B	Dibromofluoromethane	% Rec.	101	103	104
8260B	α,α,α-Trifluorotoluene	% Rec.	98.8	93.7	103
8260B	4-Bromofluorobenzene	% Rec.	103	93.9	94.3
8015	C_{10}-C_{28} Diesel Range	mg/kg	<4.0	<4.0	<4.0

Lab Sample ID			L632922-04	L634434-01	L639891-01
Client Sample ID			SS04-042513	SS01-050613	SS01-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8015	C_{28}-C_{40} Oil Range	mg/kg	<4.0	<4.0	<4.0
8015	o-Terphenyl	% Rec.	94.0	83.1	70.8
8270D-SIM	Anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Chrysene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluorene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Naphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Phenanthrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	1-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Chloronaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Nitrobenzene-d_5	% Rec.	77.7	80.6	99.4
8270D-SIM	2-Fluorobiphenyl	% Rec.	79.0	95.0	87.5
8270D-SIM	p-Terphenyl-d_{14}	% Rec.	76.3	119	82.9

Table 10. 5 USACE LAND Results.

Lab Sample ID			L632922-06	L632922-07	L634434-06	L639891-03	L639891-08
Client Sample ID			SS06-042513	SS07-042513	SS08-050613	SS03-060513	SS10-060513
Collection Date			4/25/2013	4/25/2013	5/6/2013	6/5/2013	6/5/2013
Method	Parameter	Units	Value	Value	Value	Value	Value
9056	Bromide	mg/kg	<10	<10	<10	<10	<10
9056	Chloride	mg/kg	100	95	67	55	57
9056	Sulfate	mg/kg	940	760	89	980	860
9045D	pH	su	8.3	8.3	8.2	7.8	7.8
Calc.	Sodium Adsorption Ratio		3.1	3.1	2.5	0.44	0.48
9050AMod	Specific Conductance	µmhos/cm	1200	1200	620	1100	980
6010B	Aluminum	mg/kg	830	2300	4100	5200	5400
6010B	Antimony	mg/kg	<5.0	<5.0	<1.0	<1.0	<1.0
6010B	Arsenic	mg/kg	1.5	2.3	3.2	6.5	3.5
6010B	Barium	mg/kg	56	82	43	80	70
6010B	Beryllium	mg/kg	0.12	0.36	0.15	0.13	0.23
6010B	Boron	mg/kg	<10	<10	<10	<10	<10
6010B	Cadmium	mg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
6010B	Chromium	mg/kg	1.7	3.8	6.8	9.4	12
6010B	Copper	mg/kg	2.7	4.8	3.6	7.9	7.8
6010B	Lead	mg/kg	1.6	3.2	2.4	5.2	5.9
6010B	Nickel	mg/kg	3.5	6.6	6.6	10	11
6010B	Selenium	mg/kg	<1.0	<1.0	<1.0	1.1	<1.0
6010B	Silver	mg/kg	<0.50	<1.0	<0.50	<0.50	<0.50
6010B	Thallium	mg/kg	<5.0	<5.0	<1.0	<1.0	<1.0
6010B	Zinc	mg/kg	5.7	12	15	31	29
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	95.2	95.3	98.8	99.1	99.1
8260B	Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Lab Sample ID			L632922-06	L632922-07	L634434-06	L639891-03	L639891-08
Client Sample ID			SS06-042513	SS07-042513	SS08-050613	SS03-060513	SS10-060513
Collection Date			4/25/2013	4/25/2013	5/6/2013	6/5/2013	6/5/2013
Method	Parameter	Units	Value	Value	Value	Value	Value
8260B	Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
8260B	Total Xylenes	mg/kg	<0.015	<0.015	<0.015	<0.015	<0.015
8260B	Toluene-d_8	% Rec.	101	102	100	99.9	93.2
8260B	Dibromofluoromethane	% Rec.	101	102	110	103	91.1
8260B	α,α,α-Trifluorotoluene	% Rec.	102	101	98.6	102	100
8260B	4-Bromofluorobenzene	% Rec.	102	98.4	92.0	96.1	93.3
8015	C_{10}-C_{28} Diesel Range	mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0
8015	C_{28}-C_{40} Oil Range	mg/kg	<4.0	<4.0	<4.0	7.0	11
8015	o-Terphenyl	% Rec.	92.4	90.2	85.6	72.5	81.3
8270D-SIM	Anthracene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthylene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)anthracene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	0.012
8270D-SIM	Benzo(a)pyrene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	0.012
8270D-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	0.016
8270D-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	0.0079
8270D-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
8270D-SIM	Chrysene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	0.014
8270D-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060	0.0067	0.028
8270D-SIM	Fluorene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
8270D-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
8270D-SIM	Naphthalene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020

Lab Sample ID			L632922-06	L632922-07	L634434-06	L639891-03	L639891-08
Client Sample ID			SS06-042513	SS07-042513	SS08-050613	SS03-060513	SS10-060513
Collection Date			4/25/2013	4/25/2013	5/6/2013	6/5/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**	**Value**	**Value**
8270D-SIM	Phenanthrene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	0.013
8270D-SIM	Pyrene	mg/kg	<0.0060	<0.0060	<0.0060	<0.0060	0.022
8270D-SIM	1-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020
8270D-SIM	2-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020
8270D-SIM	2-Chloronaphthalene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020
8270D-SIM	Nitrobenzene-d_5	% Rec.	72.3	73.8	100	90.4	87.7
8270D-SIM	2-Fluorobiphenyl	% Rec.	77.6	79.7	101	82.9	81.1
8270D-SIM	p-Terphenyl-d_{14}	% Rec.	91.5	91.1	123	88.5	82.7

Table 11. 6 USACE LAND Results.

Lab Sample ID			L632922-02	L634434-05	L639891-06
Client Sample ID			SS02-042513	SS07-050613	SS06-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
9056	Bromide	mg/kg	<10	<10	<10
9056	Chloride	mg/kg	150	150	57
9056	Sulfate	mg/kg	640	4300	540
9045D	pH	su	7.9	7.8	7.7
Calc.	Sodium Adsorption Ratio		1.7	3.4	0.4
9050AMod	Specific Conductance	µmhos/cm	1100	2300	780
6010B	Aluminum	mg/kg	1700	6500	5200
6010B	Antimony	mg/kg	<1.0	<1.0	<1.0
6010B	Arsenic	mg/kg	3.3	4.3	1.9
6010B	Barium	mg/kg	47	74	64
6010B	Beryllium	mg/kg	0.22	0.25	0.22
6010B	Boron	mg/kg	<10	<10	<10
6010B	Cadmium	mg/kg	<0.25	<0.25	<0.25
6010B	Chromium	mg/kg	3.6	10	12
6010B	Copper	mg/kg	5.0	7.2	7.2
6010B	Lead	mg/kg	4.0	4.5	5.0
6010B	Nickel	mg/kg	7.0	9.4	10
6010B	Selenium	mg/kg	<1.0	<1.0	<1.0
6010B	Silver	mg/kg	<0.50	<0.50	<0.50
6010B	Thallium	mg/kg	<1.0	<1.0	1.2
6010B	Zinc	mg/kg	18	26	26
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	<0.50	<0.50	<0.50
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	97.9	94.5	99.2

Lab Sample ID			L632922-02	L634434-05	L639891-06
Client Sample ID			SS02-042513	SS07-050613	SS06-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8260B	Benzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Toluene	mg/kg	<0.025	<0.025	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Total Xylenes	mg/kg	<0.015	<0.015	<0.015
8260B	Toluene-d_8	% Rec.	99.7	97.7	99.0
8260B	Dibromofluoromethane	% Rec.	102	105	103
8260B	α,α,α-Trifluorotoluene	% Rec.	102	94.2	102
8260B	4-Bromofluorobenzene	% Rec.	105	91.9	99.1
8015	C_{10}-C_{28} Diesel Range	mg/kg	<4.0	<4.0	<4.0
8015	C_{28}-C_{40} Oil Range	mg/kg	<4.0	<4.0	6.8
8015	o-Terphenyl	% Rec.	66.8	54.0	67.6
8270D-SIM	Anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Chrysene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060

Lab Sample ID			L632922-02	L634434-05	L639891-06
Client Sample ID			SS02-042513	SS07-050613	SS06-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	Parameter	Units	Value	Value	Value
8270D-SIM	Fluorene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Naphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Phenanthrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	1-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Chloronaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Nitrobenzene-d_5	% Rec.	75.4	78.3	88.1
8270D-SIM	2-Fluorobiphenyl	% Rec.	70.6	89.5	80.8
8270D-SIM	p-Terphenyl-d_{14}	% Rec.	66.2	104	84.1

Table 12. 7 USACE LAND Results.

Lab Sample ID			L632922-05	L634434-03	L639891-05
Client Sample ID			SS05-042513	SS04-050613	SS05-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	Parameter	Units	Value	Value	Value
9056	Bromide	mg/kg	<10	<10	<10
9056	Chloride	mg/kg	150	100	52
9056	Sulfate	mg/kg	700	980	<50
9045D	pH	su	8.2	7.9	8.3
Calc.	Sodium Adsorption Ratio		2.9	4.1	0.4
9050AMod	Specific Conductance	µmhos/cm	960	1600	100

Lab Sample ID			L632922-05	L634434-03	L639891-05
Client Sample ID			SS05-042513	SS04-050613	SS05-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
6010B	Aluminum	mg/kg	1700	5000	2700
6010B	Antimony	mg/kg	<1.0	<1.0	<1.0
6010B	Arsenic	mg/kg	3.4	4.3	2.7
6010B	Barium	mg/kg	39	46	28
6010B	Beryllium	mg/kg	0.19	0.13	<0.10
6010B	Boron	mg/kg	<10	<10	<10
6010B	Cadmium	mg/kg	<0.25	<0.25	<0.25
6010B	Chromium	mg/kg	3.0	9.7	6.0
6010B	Copper	mg/kg	4.6	4.4	2.0
6010B	Lead	mg/kg	3.4	2.6	1.4
6010B	Nickel	mg/kg	7.6	8.2	5.5
6010B	Selenium	mg/kg	<1.0	<1.0	<1.0
6010B	Silver	mg/kg	<0.50	<0.50	<0.50
6010B	Thallium	mg/kg	<1.0	<1.0	<1.0
6010B	Zinc	mg/kg	12	16	14
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	<0.50	<0.50	<0.50
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	95.1	94.5	99.0
8260B	Benzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Toluene	mg/kg	<0.025	<0.025	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Total Xylenes	mg/kg	<0.015	<0.015	<0.015
8260B	Toluene-d_8	% Rec.	99.7	99.0	101
8260B	Dibromofluoromethane	% Rec.	101	104	107
8260B	α,α,α-Trifluorotoluene	% Rec.	100	93.7	103

Lab Sample ID			L632922-05	L634434-03	L639891-05
Client Sample ID			SS05-042513	SS04-050613	SS05-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8260B	4-Bromofluorobenzene	% Rec.	102	94.3	95.8
8015	C_{10}-C_{28} Diesel Range	mg/kg	<4.0	<4.0	<4.0
8015	C_{28}-C_{40} Oil Range	mg/kg	<4.0	<4.0	4.8
8015	o-Terphenyl	% Rec.	88.0	84.4	80.6
8270D-SIM	Anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Chrysene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluorene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Naphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Phenanthrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	1-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Chloronaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Nitrobenzene-d_5	% Rec.	70.7	82.1	89.0

Lab Sample ID			L632922-05	L634434-03	L639891-05
Client Sample ID			SS05-042513	SS04-050613	SS05-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	Parameter	Units	Value	Value	Value
8270D-SIM	2-Fluorobiphenyl	% Rec.	75.1	91.1	80.9
8270D-SIM	p-Terphenyl-d_{14}	% Rec.	86.9	123	84.7

Table 13. 1 CONTROL (SE) Results.

Lab Sample ID			L633418-01	L634434-04	L639891-04
Client Sample ID			SS09-42913	SS05-050613	SS04-060513
Collection Date			4/29/2013	5/6/2013	6/5/2013
Method	Parameter	Units	Value	Value	Value
9056	Bromide	mg/kg	<10	<10	<10
9056	Chloride	mg/kg	62	62	55
9056	Sulfate	mg/kg	<50	<50	<50
9045D	pH	su	8.4	8.6	8.3
Calc.	Sodium Adsorption Ratio		0.86	0.45	0.91
9050AMod	Specific Conductance	µmhos/cm	67	130	280
6010B	Aluminum	mg/kg	2400	2300	5500
6010B	Antimony	mg/kg	<1.0	<1.0	<1.0
6010B	Arsenic	mg/kg	2.3	2.5	3.2
6010B	Barium	mg/kg	20	26	77
6010B	Beryllium	mg/kg	0.16	<0.10	0.11
6010B	Boron	mg/kg	<10	<10	<10
6010B	Cadmium	mg/kg	<0.25	<0.25	<0.25
6010B	Chromium	mg/kg	5.0	4.3	8.8
6010B	Copper	mg/kg	1.3	1.1	5.9

Lab Sample ID			L633418-01	L634434-04	L639891-04
Client Sample ID			SS09-42913	SS05-050613	SS04-060513
Collection Date			4/29/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
6010B	Lead	mg/kg	1.4	1.4	3.1
6010B	Nickel	mg/kg	4.0	4.7	9.5
6010B	Selenium	mg/kg	<1.0	<1.0	1.2
6010B	Silver	mg/kg	<0.50	<0.50	<0.50
6010B	Thallium	mg/kg	<1.0	<1.0	<1.0
6010B	Zinc	mg/kg	12	9.2	24
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	<0.50	<0.50	<0.50
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	93.3	94.3	99.5
8260B	Benzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Toluene	mg/kg	<0.025	<0.025	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Total Xylenes	mg/kg	<0.015	<0.015	<0.015
8260B	Toluene-d_8	% Rec.	100	98.1	101
8260B	Dibromofluoromethane	% Rec.	103	104	103
8260B	α,α,α-Trifluorotoluene	% Rec.	104	94.7	101
8260B	4-Bromofluorobenzene	% Rec.	94.6	91.6	91.9
8015	C_{10}-C_{28} Diesel Range	mg/kg	<4.0	<4.0	<4.0
8015	C_{28}-C_{40} Oil Range	mg/kg	<4.0	<4.0	<4.0
8015	o-Terphenyl	% Rec.	69.8	82.8	80.0
8270D-SIM	Anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)pyrene	mg/kg	<0.0060	<0.0060	<0.0060

Lab Sample ID			L633418-01	L634434-04	L639891-04
Client Sample ID			SS09-42913	SS05-050613	SS04-060513
Collection Date			4/29/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8270D-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Chrysene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluorene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Naphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Phenanthrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	1-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Chloronaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Nitrobenzene-d_5	% Rec.	81.6	100	81.0
8270D-SIM	2-Fluorobiphenyl	% Rec.	89.8	110	74.2
8270D-SIM	p-Terphenyl-d_{14}	% Rec.	94.4	131	63.1

Table 14. 2 CONTROL (NE) Results.

Lab Sample ID			L632922-08	L634434-07	L639891-07
Client Sample ID			SS08-042513	SS09-050613	SS07-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
9056	Bromide	mg/kg	<10	<10	<10
9056	Chloride	mg/kg	150	350	57
9056	Sulfate	mg/kg	1700	9400	2400
9045D	pH	su	7.8	8	7.6
Calc.	Sodium Adsorption Ratio		2.0	6.7	0.4
9050AMod	Specific Conductance	µmhos/cm	2900	3500	1600
6010B	Aluminum	mg/kg	1600	5800	4200
6010B	Antimony	mg/kg	<2.0	<1.0	<1.0
6010B	Arsenic	mg/kg	3.3	2.8	<1.0
6010B	Barium	mg/kg	32	57	43
6010B	Beryllium	mg/kg	0.19	0.18	0.16
6010B	Boron	mg/kg	<10	<10	<10
6010B	Cadmium	mg/kg	<0.25	<0.25	<0.25
6010B	Chromium	mg/kg	3.3	9.3	9.9
6010B	Copper	mg/kg	4.0	5.2	4.0
6010B	Lead	mg/kg	2.8	2.8	3.1
6010B	Nickel	mg/kg	6.3	7.8	7.4
6010B	Selenium	mg/kg	<1.0	<1.0	1.3
6010B	Silver	mg/kg	<0.50	<0.50	<0.50
6010B	Thallium	mg/kg	<1.0	<1.0	1.2
6010B	Zinc	mg/kg	15	21	18
8015D/GRO	TPH (GC/FID) Low Fraction	mg/kg	<0.50	<0.50	<0.50
602/8015	α,α,α-Trifluorotoluene (FID)	% Rec.	94.8	98.6	99.4

Lab Sample ID			L632922-08	L634434-07	L639891-07
Client Sample ID			SS08-042513	SS09-050613	SS07-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8260B	Benzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Toluene	mg/kg	<0.025	<0.025	<0.025
8260B	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050
8260B	Total Xylenes	mg/kg	<0.015	<0.015	<0.015
8260B	Toluene-d_8	% Rec.	101	99.7	94.6
8260B	Dibromofluoromethane	% Rec.	98.6	112	92.4
8260B	α,α,α-Trifluorotoluene	% Rec.	101	97.9	100
8260B	4-Bromofluorobenzene	% Rec.	99.0	90.6	93.8
8015	C_{10}-C_{28} Diesel Range	mg/kg	<4.0	<4.0	<4.0
8015	C_{28}-C_{40} Oil Range	mg/kg	<4.0	<4.0	<4.0
8015	o-Terphenyl	% Rec.	78.4	30.9	58.2
8270D-SIM	Anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Acenaphthylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(a)pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(b)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(g,h,i)perylene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Benzo(k)fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Chrysene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Dibenz(a,h)anthracene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluoranthene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Fluorene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Indeno(1,2,3-cd)pyrene	mg/kg	<0.0060	<0.0060	<0.0060

Lab Sample ID			L632922-08	L634434-07	L639891-07
Client Sample ID			SS08-042513	SS09-050613	SS07-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8270D-SIM	Naphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Phenanthrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	Pyrene	mg/kg	<0.0060	<0.0060	<0.0060
8270D-SIM	1-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Methylnaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	2-Chloronaphthalene	mg/kg	<0.020	<0.020	<0.020
8270D-SIM	Nitrobenzene-d_5	% Rec.	82.4	81.1	87.2
8270D-SIM	2-Fluorobiphenyl	% Rec.	78.6	87.0	81.4
8270D-SIM	p-Terphenyl-d_{14}	% Rec.	84.8	103	78.7

7.2 WATER SAMPLE RESULTS

A summary of the water analytical data collected from sampling points 9 USACE and 9 USACE are provided in Tables 15 and 16, respectively. The tables provide data for the April 25, May 6, and June 5, 2013 sampling events.

Table 15. 8 USACE WATER Results

Lab Sample ID			L632831-02	L634434-09	L639811-01
Client Sample ID			WS02-042513	SS03-050613	WS01-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
9056	Bromide	mg/l	<1.0	<1.0	<1.0
9056	Chloride	mg/l	1.8	2.6	3.6
9056	Fluoride	mg/l	0.18	0.17	0.21
9056	Sulfate	mg/l	62	82	110

Lab Sample ID			L632831-02	L634434-09	L639811-01
Client Sample ID			WS02-042513	SS03-050613	WS01-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
2320 B-2011	Alkalinity	mg/l	61	71	120
2320 B-2011	Alkalinity, Bicarbonate	mg/l	57	71	120
2320 B-2011	Alkalinity, Carbonate	mg/l	<20	<20	<20
2320 B-2011	Alkalinity, Hydroxide	mg/l	<20	<20	<20
130.1	Hardness, Total (mg/L as $CaCO_3$)	mg/l	95	120	180
Calc.	Total Nitrogen	mg/l	0.81	0.63	0.5
350.1	Ammonia Nitrogen	mg/l	0.15	<0.10	0.56
9040C	pH	su	8.1	8.0	8.2
353.2	Nitrate-Nitrite	mg/l	<0.10	<0.10	<0.10
365.4	Phosphorus, Total	mg/l	<0.10	<0.10	<0.20
9050A	Specific Conductance	µmhos/cm	260	340	470
351.2	Kjeldahl Nitrogen, TKN	mg/l	0.81	0.63	0.5
2130 B-2011	Turbidity	NTU	4.8	4.4	1.7
2540 C-2011	Dissolved Solids	mg/l	130	200	330
6010B	Aluminum	mg/l	<0.10	<0.10	<0.10
6010B	Antimony	mg/l	<0.020	<0.0010*	<0.0010*
6010B	Arsenic	mg/l	<0.020	0.0024*	0.0020*
6010B	Barium	mg/l	0.023	0.028	0.046
6010B	Beryllium	mg/l	<0.0020	<0.0010*	<0.0010*
6010B	Boron	mg/l	<0.20	<0.20	<0.20
6010B	Cadmium	mg/l	<0.0050	<0.00050*	<0.00050*
6010B	Calcium	mg/l	25	31	43
6010B	Chromium	mg/l	<0.010	<0.0020*	<0.0020*
6010B	Copper	mg/l	<0.020	0.010*	<0.0020*
6010B	Iron	mg/l	0.44	0.19	0.22

Lab Sample ID			L632831-02	L634434-09	L639811-01
Client Sample ID			WS02-042513	SS03-050613	WS01-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
6010B	Lead	mg/l	<0.0050	<0.0010*	<0.0010*
6010B	Magnesium	mg/l	7.1	11	18
6010B	Manganese	mg/l	0.16	0.040	0.074
6010B	Nickel	mg/l	<0.020	0.018*	0.0034*
6010B	Potassium	mg/l	1.7	3.0	3.9
6010B	Selenium	mg/l	<0.020	0.0016*	<0.0010*
6010B	Silicon	mg/l	0.78	0.41	0.68
6010B	Silver	mg/l	<0.010	<0.0010*	<0.0010*
6010B	Sodium	mg/l	10	16	24
6010B	Thallium	mg/l	0.030	<0.0010*	<0.0010*
6010B	Zinc	mg/l	<0.030	<0.010*	<0.010*
Calc.	Silica	mg/l	1.7	0.87	1.4
8015D/GRO	TPH (GC/FID) Low Fraction	mg/l	<0.10	<0.10	<0.10
8015D/GRO	α,α,α-Trifluorotoluene (FID)	% Rec.	97.7	98.3	100
8260B	Benzene	mg/l	<0.0010	<0.0010	<0.0010
8260B	Toluene	mg/l	<0.0050	<0.0050	<0.0050
8260B	Ethylbenzene	mg/l	<0.0010	<0.0010	<0.0010
8260B	Total Xylenes	mg/l	<0.0030	<0.0030	<0.0030
8260B	Toluene-d_8	% Rec.	93.5	101	101
8260B	Dibromofluoromethane	% Rec.	90.5	105	98.8
8260B	α,α,α-Trifluorotoluene	% Rec.	102	106	104
8260B	4-Bromofluorobenzene	% Rec.	99.8	93.1	99.6
8015	C_{10}-C_{28} Diesel Range	mg/l	<0.10	<0.10	<0.10
8015	C_{28}-C_{40} Oil Range	mg/l	<0.10	<0.10	<0.10
8015	o-Terphenyl	% Rec.	107	98.4	86.0

Lab Sample ID			L632831-02	L634434-09	L639811-01
Client Sample ID			WS02-042513	SS03-050613	WS01-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
8270C-SIM	Anthracene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Acenaphthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Acenaphthylene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(a)anthracene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(a)pyrene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(b)fluoranthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(g,h,i)perylene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(k)fluoranthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Chrysene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Dibenz(a,h)anthracene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Fluoranthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Fluorene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Indeno(1,2,3-cd)pyrene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Naphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	Phenanthrene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Pyrene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	1-Methylnaphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	2-Methylnaphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	2-Chloronaphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	Nitrobenzene-d_5	% Rec.	109	119	102
8270C-SIM	2-Fluorobiphenyl	% Rec.	112	114	105
8270C-SIM	p-Terphenyl-d_{14}	% Rec.	115	122	110

* Indicates analysis performed by Method 6020

Table 16. 9 USACE WATER Results

Lab Sample ID			L632831-01	L634434-10	L639811-02
Client Sample ID			WS01-042513	SS06-050613	WS02-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
9056	Bromide	mg/l	<1.0	<1.0	<1.0
9056	Chloride	mg/l	2.2	2.7	3.7
9056	Fluoride	mg/l	0.13	0.12	0.22
9056	Sulfate	mg/l	66	81	110
2320 B-2011	Alkalinity	mg/l	71	73	120
2320 B-2011	Alkalinity, Bicarbonate	mg/l	63	73	120
2320 B-2011	Alkalinity, Carbonate	mg/l	<20	<20	<20
2320 B-2011	Alkalinity, Hydroxide	mg/l	<20	<20	<20
130.1	Hardness, Total (mg/L as $CaCO_3$)	mg/l	96	120	170
Calc.	Total Nitrogen	mg/l	0.97	0.72	0.44
350.1	Ammonia Nitrogen	mg/l	0.12	<0.10	0.33
9040C	pH	su	8.0	8.2	8.2
353.2	Nitrate-Nitrite	mg/l	<0.10	<0.10	<0.10
365.4	Phosphorus,Total	mg/l	<0.10	<0.10	<0.10
9050A	Specific Conductance	µmhos/cm	290	350	470
351.2	Kjeldahl Nitrogen, TKN	mg/l	0.97	0.72	0.44
2130 B-2011	Turbidity	NTU	2.4	2.6	2.2
2540 C-2011	Dissolved Solids	mg/l	140	200	320
6010B	Aluminum	mg/l	<0.10	<0.10	<0.10
6010B	Antimony	mg/l	<0.020	<0.0010*	<0.0010*
6010B	Arsenic	mg/l	<0.020	0.0014*	0.0020*
6010B	Barium	mg/l	0.026	0.030	0.047
6010B	Beryllium	mg/l	<0.0020	<0.0010*	<0.0010*
6010B	Boron	mg/l	<0.20	<0.20	<0.20
6010B	Cadmium	mg/l	<0.0050	<0.00050*	<0.00050*

Lab Sample ID			L632831-01	L634434-10	L639811-02
Client Sample ID			WS01-042513	SS06-050613	WS02-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	**Parameter**	**Units**	**Value**	**Value**	**Value**
6010B	Calcium	mg/l	29	32	44
6010B	Chromium	mg/l	<0.010	<0.0020*	<0.0020*
6010B	Copper	mg/l	<0.020	<0.0020*	<0.0020*
6010B	Iron	mg/l	0.26	0.19	0.27
6010B	Lead	mg/l	<0.0050	<0.0010*	<0.0010*
6010B	Magnesium	mg/l	8.4	11	19
6010B	Manganese	mg/l	0.16	0.037	0.098
6010B	Nickel	mg/l	<0.020	<0.0010*	0.0034*
6010B	Potassium	mg/l	2.1	2.9	3.8
6010B	Selenium	mg/l	<0.020	<0.0010*	<0.0010*
6010B	Silicon	mg/l	0.80	0.37	0.80
6010B	Silver	mg/l	<0.010	<0.0010*	<0.0010*
6010B	Sodium	mg/l	19	17	24
6010B	Thallium	mg/l	0.022	<0.0010*	<0.0010*
6010B	Zinc	mg/l	<0.030	<0.010*	<0.010*
Calc.	Silica	mg/l	1.7	0.79	1.7
8015D/GRO	TPH (GC/FID) Low Fraction	mg/l	<0.10	<0.10	<0.10
8015D/GRO	α,α,α-Trifluorotoluene (FID)	% Rec.	97.8	98.5	99.9
8260B	Benzene	mg/l	<0.0010	<0.0010	<0.0010
8260B	Toluene	mg/l	<0.0050	<0.0050	<0.0050
8260B	Ethylbenzene	mg/l	<0.0010	<0.0010	<0.0010
8260B	Total Xylenes	mg/l	<0.0030	<0.0030	<0.0030
8260B	Toluene-d_8	% Rec.	101	100	99.3
8260B	Dibromofluoromethane	% Rec.	107	104	101
8260B	α,α,α-Trifluorotoluene	% Rec.	104	104	99.7
8260B	4-Bromofluorobenzene	% Rec.	108	95.1	101

Lab Sample ID			L632831-01	L634434-10	L639811-02
Client Sample ID			WS01-042513	SS06-050613	WS02-060513
Collection Date			4/25/2013	5/6/2013	6/5/2013
Method	Parameter	Units	Value	Value	Value
8015	C_{10}-C_{28} Diesel Range	mg/l	<0.10	0.11	<0.10
8015	C_{28}-C_{40} Oil Range	mg/l	<0.10	<0.10	<0.10
8015	o-Terphenyl	% Rec.	108	102	87.1
8270C-SIM	Anthracene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Acenaphthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Acenaphthylene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(a)anthracene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(a)pyrene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(b)fluoranthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(g,h,i)perylene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Benzo(k)fluoranthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Chrysene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Dibenz(a,h)anthracene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Fluoranthene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Fluorene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Indeno(1,2,3-cd)pyrene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Naphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	Phenanthrene	mg/l	<0.000050	<0.000050	<0.000050
8270C-SIM	Pyrene	mg/l	<0.000050	0.000063	<0.000050
8270C-SIM	1-Methylnaphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	2-Methylnaphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	2-Chloronaphthalene	mg/l	<0.00025	<0.00025	<0.00025
8270C-SIM	Nitrobenzene-d_5	% Rec.	116	107	105
8270C-SIM	2-Fluorobiphenyl	% Rec.	123	105	107
8270C-SIM	p-Terphenyl-d_{14}	% Rec.	125	107	54.7

* Indicates analysis performed by Method 6020

8 OBSERVATIONS AND INTERPRETATIONS

Samples collected over the monitoring and three sampling campaigns revealed only a few instances of hydrocarbon components above detection limits. The soil sample collected at the site possessing discolored snow possessed hydrocarbon components at just above detection limits. Additionally, one water sample and three soil samples out of six water samples and 15 soil samples possessed hydrocarbon components.

The most interesting trend was that the only soil sample (3 USACE LAND) to possess hydrocarbon components from the first sampling campaign was collected in roughly the same area as the soil sample from the discolored snow. Soil samples from the second campaign did not show any hydrocarbon contamination. Yet, in the third sampling campaign, samples from the edges of the impact zone (5 USACE LAND & 7 USACE LAND) possessed hydrocarbon components.

Interestingly, these samples from the third sampling campaign were collected from an area that had been subject to unauthorized all-terrain-vehicle (ATV), side-by-side, and full-size 4-wheel drive vehicle traffic. Just prior to the third sampling campaign, heavy rainfall had saturated the soil in the area.

Possible explanations for the observed petroleum in the collected samples are:

1.) For 3 USACE LAND collected on April 25, 2013, the hydrocarbon present in the sample was most likely due to impact from the Lunker Federal #2 well event.
2.) For 5 USACE LAND and 7 USACE LAND collected on June 5, 2013, the hydrocarbon present could be due to either water floating hydrocarbon impact from the Lunker Federal #2 well event to the soil surface or hydrocarbons deposited by the unauthorized motorized vehicle usage of the area, as shown in Photographs 4 and 9 in Appendix B

Anions, specific conductance, and metals concentrations in soil and surface water varied widely in many instances from event to event. These fluctuations are likely associated with varying run-off flow rates.

During the sampling campaign conducted on June 5, 2013, a total of 4 Piping Plovers were observed within the impact zone. Additionally, one other Piping Plover was observed near the 2 CONTROL (NE) sampling site.

9 CONCLUSIONS

The WMA and associated impact zone, as depicted in Figure 1, appear to have been impacted with hydrocarbons and produced water from the Slawson Lunker Federal #2 well event of December 12 through 14, 2012. As a result of extensive cleanup efforts and natural degradation of the hydrocarbons within the impact zone, soil and water sampling campaigns have revealed minimal impact to the WMA and habitat utilized by the Piping Plover.

Piping Plover were observed within the impact zone on June 5, 2013.

The State of North Dakota Department of Health (NDDH) manages petroleum contamination of soil and water through two Divisions. The Division of Waste Management manages contamination of soil and groundwater. The Division of Water Quality manages contamination of surface water. Table 17 lists the action levels each division utilizes for its own areas of concern.

Table 17. North Dakota Department of Health Action Levels for Petroleum Contamination.

	Soil	Groundwater	Surface Water
Division	Waste Management	Waste Management	Water Quality
TPH Limit	100 ppm	100 ppm	Detection Limit
Benzene Limit	-	5 ppb	Detection Limit

In no instance did any sample show values exceeding the North Dakota Department of Health action levels listed in Table 17.

Additionally, the EPA lists soil contaminant levels that are considered to be protective of groundwater. As a guideline, these values indicate that no further action should be required. These values are listed in Table 18.

Table 18. EPA Soil Screening Levels Associated with Groundwater Protection.

Chemical	Maximum Level
n-Pentane	1.0 mg/kg
n-Hexane	0.18 mg/kg
Benzene	0.0002 mg/kg
Ethylbenzene	0.0015 mg/kg
Toluene	0.059 mg/kg
o-Xylene	0.019 mg/kg
m-Xylene	0.018 mg/kg
p-Xylene	0.018 mg/kg

While the TPH values observed would rule out the possibility of an exceedence by n-pentane, any exceedence by n-hexane cannot be ruled out. However, all TPH soil values were below 0.50 mg/kg. All observed values for benzene, ethylbenzene, toluene, and xylenes were below the EPA levels listed in Table 18.

On the basis of the sampling and associated analysis campaigns, and the observation of Piping Plover, it is the recommendation of Lowham Walsh that no further remediation or sampling is required within the impact zone at this time.

APPENDIX B

Photographs

Photograph 1: 3 USACE LAND Location on June 5, 2013.

Photograph 2. 4 USACE LAND Location on June 5, 2013.

Photograph 3. 5 USACE LAND Location on June 5, 2013.

Photograph 4. 6 USACE LAND Location on June 5, 2013.

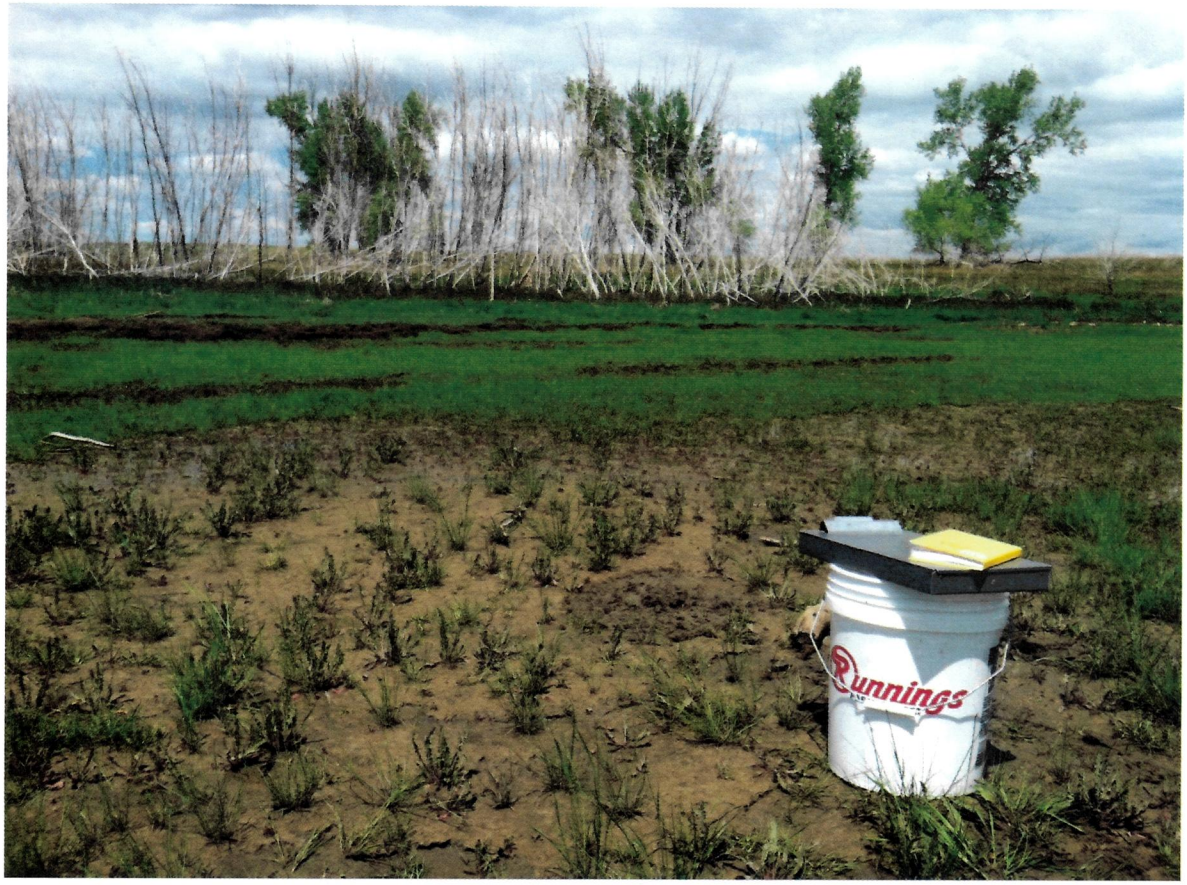
Photograph 5. 7 USACE LAND Location on June 5, 2013.

Photograph 6. 8 USACE WATER Location on June 5, 2013.

Photograph 7. 9 USACE WATER Location on June 5, 2013.

Photograph 8. 1 CONTROL SE Location on June 5, 2013.

Photograph 9. 2 CONTROL (NE) Location on June 5, 2013.



Photograph 10. First Runoff Event, April 1, 2013.

Photograph 11. First Runoff Event, April 4, 2013.

Photograph 12. First Runoff Event, April 9, 2013.

Photograph 13. First Runoff Event, April 10, 2013.

Photograph 14. Second Runoff Event, April 19, 2013.

Photograph 15. Coniferous trees to after Ecobiotic® treatment, June 5, 2013.

Photograph 16. View of treed area from northeast corner of WMA, June 5, 2013.

Photograph 17. Deciduous trees after EcoBiotic® application, June 5, 2013.

Photograph 18. Prescribed Burn on June 10, 2013.

Photograph 19. Prescribed Burn on June 10, 2013.

Photograph 20. Prescribed Burn on June 10, 2013.